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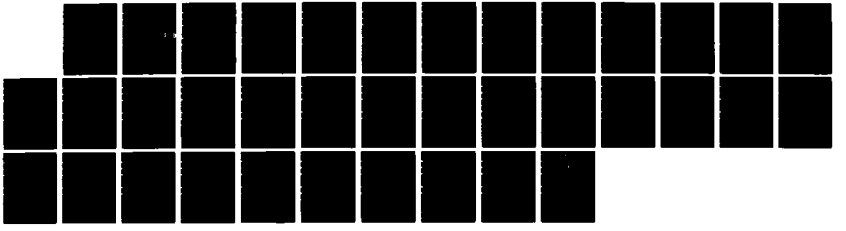

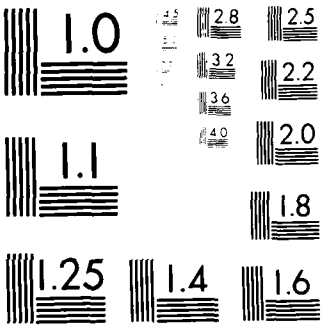

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AIR FORCE INTEGRATED READINESS MEASUREMENT SYSTEM (AFIRMS)

ANALYSIS OF STRATEGIC AIR COMMAND (SAC) REQUIREMENTS ANALYSIS

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STRATEGIC AIR COMMAND REQUIREMENTS ANALYSIS

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SECTION 1. GENERAL

1.1 Purpose. This study is an initial analysis to tailor the Air Force Integrated Readiness Measurement System (AFIRMS) to the needs of Strategic Air Command (SAC). While much more analysis will be needed to develop and implement AFIRMS in the Strategic Air Command, this effort will point the way for the follow-on developmental analysis. The SAC requirements analysis is part of the development of AFIRMS, a summary of which appears below. The purpose of this report is to discuss SAC AFIRMS information requirements and potential AFIRMS users, and to identify any information systems with which AFIRMS will need to interface in order to obtain the data it needs. Prior to July 1985, a Learning Prototype Phase (LPP) tested the basic concepts of AFIRMS on an experimental testbed system which linked a base, a major command (MAJCOM) headquarters, and Headquarters, United States Air Force (HQ USAF). That phase focused on the tactical fighter environment at Headquarters, United States Air Forces in Europe (HQ USAFE) and the 52TFW.

This study, and a concurrent study of Military Airlift Command (MAC) broaden the base upon which AFIRMS rests. This base will support the definition and design phase of the AFIRMS development.

This report is based on a study carried out in July through September, 1985. The results are based primarily on interviews at Headquarters, Strategic Air Command (HQ SAC), HQ 8th Air Force (8AF), 55th Strategic Reconnaissance Wing, 28th Bombardment Wing, and the 44th Strategic Missile Wing. Additionally, Air Force and SAC regulations were analyzed and used where appropriate.

This is a preliminary review of SAC requirements related to AFIRMS. Additional analysis is required before implementation within the Strategic Air Command.

1.2 Key AFIRMS Concepts. AFIRMS is an automated, tasking based, capability assessment system. As such, AFIRMS evaluates unit and force capability to perform tasked missions based on the availability of specific resources.

a. The conceptual requirements for AFIRMS are two-fold:

(1) Assessment of combat capability against specific tasking. The user can assess unit/force combat capability against any planned or ad hoc tasking, e.g., War Mobilization Plan (WMP), Operation Plan (OPlan), Fragmentary Order, Air Tasking Order (ATO), Contingency Plan, etc.

(2) Assessment of combat capability based on budget appropriations. AFIRMS provides a tool for computing long-term readiness and sustainability trends, spanning two to six fiscal years. This tool permits comparison of readiness and sustainability by fiscal year and can therefore highlight the impact of appropriation changes. Thus, changes in funding are related to changes in force readiness and sustainability. Also, senior Air Force decision makers are supported during budget deliberations and Air Force budget allocations.

b. AFIRMS implementation has two key concepts:

(1) Integrated approach to tasking based capability assessments. AFIRMS has two integrative dimensions. First, all applicable resources and their usage interactions are considered. For example, in sortie capability assessment, AFIRMS evaluates capability in terms of all four essential resource types (aircrew, aircraft, munitions, fuel), their interdependencies, and their generative components (such as spares for aircraft, training qualifications for aircrew, load crews for munitions, and hot pits for fuel). Second, other automated systems (such as the Combat Supplies Management System (CSMS), Combat Fuels Management System (CFMS), Weapon System Management Information System (WSMIS), etc.) outputs are integrated into capability assessment calculations through system interfaces between those systems and AFIRMS.

(2) Data Quality Assurance. Capability assessment is no better than the data upon which it is based. Therefore, AFIRMS emphasizes a user orientation toward quality assurance of source data. Unit and other data input level users are provided effective tools to accomplish their daily activities and therefore develop a vested interest in AFIRMS data currency and validity. Capability assessment data can then be extracted for use by higher or parallel users with maximum confidence in its validity.

1.2.2 AFIRMS Functions. Four basic AFIRMS functions combine to assess readiness capability:

a. Translate Tasking. As a tasking based capability assessment system, tasking must be converted into a standard format recognized by AFIRMS. Tasking is defined in AFIRMS to the unit level and may consist of actual, hypothetical, standard, or contingency tasking. Any of these taskings can be defined within specified WMP or OPlan constraints, at the option of the user. Likewise, the tasking may be defined by the user for present, historic or future requirements.

b. Define Resources. The resource definition function of AFIRMS ensures that information about inventory status is available and accurate. Wherever possible, this data is obtained by interface with other functional systems. As with tasking, resource information can be defined for actual, hypothetical, standard, or contingency situations, either present, historic, or future.

c. Determine Ability to Perform. Determining the force's ability to perform is the essential function of AFIRMS. The tasking and resource data are processed to determine how much of the specified tasking can be accomplished with the resources available. Ability to perform is evaluated in terms of the task metric (missions, etc.) and the cost metric (dollars) to provide readiness/sustainability and dollars to readiness assessments.

d. Aggregate, Analyze and Present Data. Aggregation, analysis and presentation ensure the proper grouping and display of information to provide useful information at the unit, major command and HQ USAF. Aggregation refers to the creation of a composite understanding of capability for several units.

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m. AFIRMS HQ USAFE Subsystem Specification, SofTech, Inc., 31 May 1985.

n. AFIRMS Analysis of MAC Capability Assessment Metrics, SofTech, Inc., 30 September 1985.

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1.4 Acronyms and Abbreviations.

ACCESS	Automated C^2 Executive Support System
ACCN	Alternate Critical Communications Network
ACS	Airborne COMINT System
ADP	Automatic Data Processing
AES	Airborne ELINT System
AFAMPE	Air Force Automatic Message Processing Equipment
AFAPG	Air Force Automatic Data Processing (ADP) Planning Guide
AFEMMIS	Air Force Equipment Maintenance Management Information System
AFIRMS	Air Force Integrated Readiness Measurement System
AFISP	Air Force Information Systems Plan

AFORMS	Air Force Operations Resource Management System
ALCC	Air Launch Control Center
ATO	Air Tasking Order
bps	Bits Per Second
C2	Command & Control
CAMS	Core Automated Maintenance System
CAS	Combat Ammunition System
CCPDS	Command Center Processing and Display System
CFEP	Communications Front End Processor
CFMS	Combat Fuels Management System
CINC	Commander in Chief
COMPES	Contingency Operations/Mobility Planning and Execution System
COMSEC	Communications Security
COTS	Commercial Off The Shelf
CPU	Central Processing Unit
CSMS	Combat Supplies Management System
DBMS	Database Management System
DDN	Defense Data Network
HQ AFLC	Headquarters, Air Force Logistics Command
HQ USAF	Headquarters United States Air Force
HQ USAFE	Headquarters United States Air Forces in Europe
HQ SAC	Headquarters Strategic Air Command
ICBM	Intercontinental Ballistic Missile
IFMIS	Integrated Force Management Information System
IOC	Initial Operating Capability
JCS	Joint Chiefs of Staff
JINTACCS	Joint Interoperability of Tactical Command and Control System
JSTPS	Joint Strategic Target Planning System
LAN	Local Area Network
LRU	Line Replacement Unit
MAC	Military Airlift Command
MAJCOM	Major Command
NAF	Numbered Air Force
NCA	National Command Authorities
OPlan	Operations Plan

OPR	Office of Primary Responsibility
PACCS	Post Attack Command Control System
POM	Program Objective Memorandum
PPBS	Planning, Programming, and Budgeting System
SAC	Strategic Air Command
SACCS	SAC Automated Command Control System
SATCOM	Satellite Communications
SCI	Sensitive Compartmented Information
SIOP	Single Integrated Operation Plan
SORN	SAC Operational Readiness Network
TPFDL	Time Phased Force and Deployment List
UPS	Uninterruptible Power Source
WIN	WWMCCS Intercomputer Network
WIS	WWMCCS Information System
WMP	War Mobilization Plan
WSMIS	Weapons System Management Information System
WWABNCP	Worldwide Airborne Command Post
WWMCCS	Worldwide Military Command and Control System

SECTION 2. SAC ORGANIZATIONAL STRUCTURE

2.1 Strategic Air Command. The Strategic Air Command organization consists of: Headquarters SAC, two Numbered Air Forces (8AF with 5 subordinate Air Divisions and 15AF with 6 subordinate Air Divisions), and 18 direct reporting units. The combat wings and groups include: 16 Bomb Wings, 8 Missile Wings, 3 Reconnassiance Wings, 7 Air Refueling Wings/Groups, and about 20 Air National Guard and Air Force Reserve Air Refueling Wings/Groups.

SAC's primary mission is execution of the Single Integrated Operations Plan (SIOP) in coordination with U.S. Navy Ballistic Missile Submarines. Operational planning for this joint mission is the responsibility of the Joint Strategic Targeting and Planning Staff (JSTPS) with headquarters adjacent to SAC Headquarters. SAC's additional missions include: reconnaissance for the SIOP and other U.S. and Allied users; air refueling support; maritime operations; strategic airlift augmentation; and conventional bombing. Command and control of the SIOP is intimately integrated with the National Command Authority (NCA). Therefore SAC has an extensive command and control system and retains operational control of its aircraft for most of its supporting missions.

2.2 HQ SAC. Headquarters SAC includes nine Deputy Chiefs of Staff (see Figure 2-1). The organization is typical of MAJCOM headquarters except for two important differences. First, some SAC staff personnel are also members of the Joint Strategic Target Planning Staff, and, second, the operations function is supported by the DCS/Operations Plans (XO) and the DCS/Operations (DO). XO is responsible for SIOP planning (in conjunction with JSTPS), and DO is responsible for current operations, training, and conventional operations.

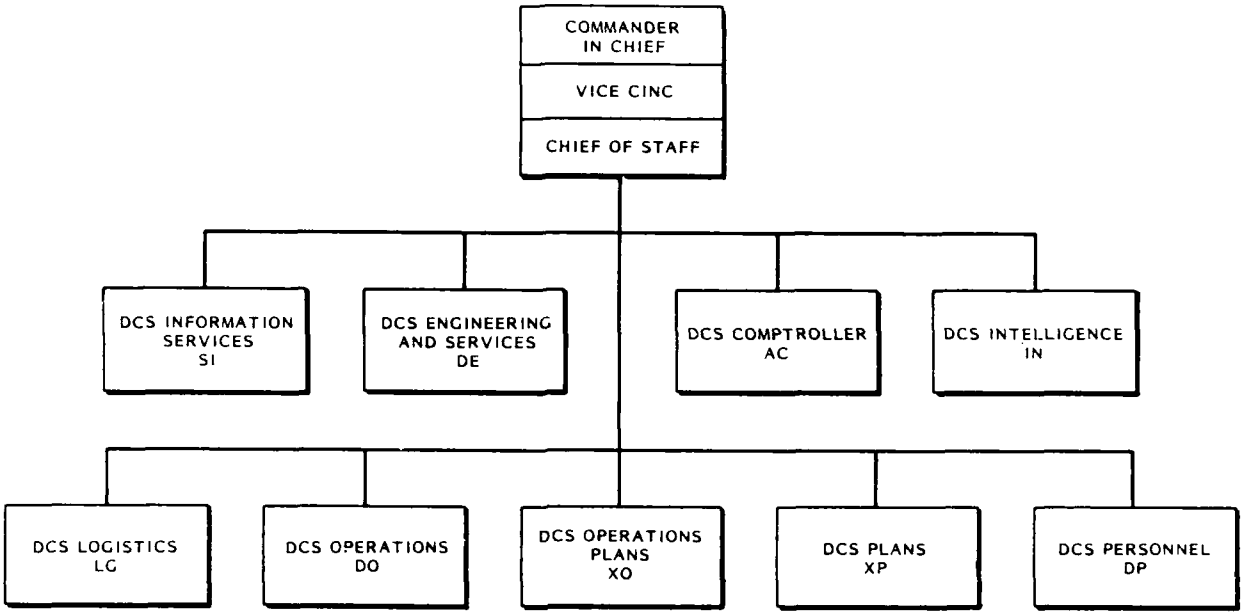

Figure 2-1. Headquarters, Strategic Air Command Organizational Chart

2.3 **SAC Numbered Air Forces.** The most important function of the NAFs is to be able to act as alternate SAC command authority. Additionally, the NAFs assist subordinate and reserve forces, wings, and groups in their peacetime, day-to-day, force management responsibilities.

2.4 **SAC Air Divisions.** Except for 7AD and 3AD, SAC Air Divisions' role in combat tasking and resource management is such that AFIRMS will not initially be required in the CONUS Air Division Headquarters. AFIRMS requirements and architecture in the two overseas air divisions require further analysis.

2.5 SAC Combat Wings and Groups. The wing is the focus of operations.

2.5.1 Missile Wings. Strategic missile wings have missiles in silos dispersed over a wide geographic area. The major activity at a missile wing is maintaining missiles on alert status. Alert missiles are controlled by launch control centers in each wing. Training and procedures checks occupy much of the time for operations crews.

2.5.2 Bomb Wings. A bomb wing typically has one squadron (sometimes two) of bombers (B-52, FB-111, or B-1) and typically a squadron (or two) of tankers. Training sorties for bombers consist of missions simulating an Emergency War Order or conventional profile. The mission generally includes: low level navigation, electronically-scored bombing practice, simulated stand-off missile launch, air refueling, and electronic countermeasures practice. Units participate in several exercises each year involving generation and launch of the aircraft.

2.5.3 Air Refueling Wings and Groups. Air refueling wings and groups have one or two squadrons of KC-135 or KC-10 aircraft. Approximately twenty Air Force reserve and Air National Guard tanker wings, or groups, perform the same refueling tasks for SIOP and tactical forces and the active duty units. Tankers practice and execute refueling of bombers, fighters, and transports. Units participate in several exercises each year and support tanker task forces to support tactical fighter deployments.

2.5.4 Reconnaissance Wings. Reconnaissance wings have several missions: electronic surveillance, electronic intelligence, photo reconnaissance, and tactical reconnaisance.

SECTION 3. SAC INFORMATION REQUIREMENTS

3.1 Importance of Requirements Definition. The AFIRMS design is driven by the needs of users at all command levels. AFIRMS' primary goals of providing tasking-based combat capability assessment and budgetary relationships to combat capability depend heavily on timely and accurate data. As a result, one of AFIRMS' related objectives is to provide outputs at all levels necessary to encourage users to keep the data current. Another objective is to interface AFIRMS with the systems from which AFIRMS requires data. A third objective is to cooperate in the development of new systems and to integrate with those systems, so that inputs from, and outputs to, the user are coordinated with as little redundancy as possible.

The principal means of encouraging users to maintain data currency is to provide a system that is part of the day-to-day operation and supports the command's combat capability and resource status evaluations. The utility of combat capability assessments depends on the user's understanding of the information and its assistance to the user in accomplishing his task. Additionally, high-level, aggregated assessments of SAC's combat capability must be consistent with more detailed assessments. Hence, the majority of this section is devoted to a description of the user's requirements for capability assessment and related information that would be required from AFIRMS.

3.1.1 AFIRMS Input Information Requirements. In assessing combat capability against specific taskings or specific fiscal constraints, AFIRMS utilizes several types of information.

a. *Tasking and resource information.* Much of the data needed by AFIRMS can be obtained from existing data systems. Tasking and resource information is a broad category which includes:

   1) Tasking data such as SIOP mission requirements, OPlans, training schedules, refueling mission data, etc.

2) Summarized resource status information such as fuel availability, munitions status, spares utilization rate, maintenance in progress, etc.

3) Unit readiness information similar to UNITREP functions.

b. Fiscal relationship information is needed to:

1) Determine the level of funding necessary to achieve and maintain the desired levels of readiness and sustainability.

2) Determine levels of readiness and sustainability that can be achieved with a given funding level.

3) Demonstrate whether readiness or sustainability actually change, given an increase or decrease of funding.

c. Notional Information. Hypothetical data is needed for "what-if" queries and forecasting purposes such as:

1) Relating changes in funding to changes in force readiness and sustainability for budget exercises.

2) Assessing alternative proposals for allocation of resources or assignments of tasking.

d. Historical Information. Historical data is used to:

1) Compute long-term readiness and sustainability trends, and

2) Track, recognize, report, and project, trends in readiness and sustainability.

3.2 SAC User Information Needs. The general flow of information that AFIRMS requires is shown in Figure 3-1. Information from the wings must include the status of wing and base resources and facilities. However, this diagram does not imply that this flow of information must be within dedicated AFIRMS channels. AFIRMS may obtain the data from other systems at HQ SAC, if it is readily available.

The remainder of Section 3.2 enumerates the general requirements for AFIRMS information. The requirements are stated in terms of the major functions of planning, peacetime resource management, exercise management, budgeting, and programming. Within each area, specific requirements for aircraft and missiles are described for SIOP and conventional tasking.

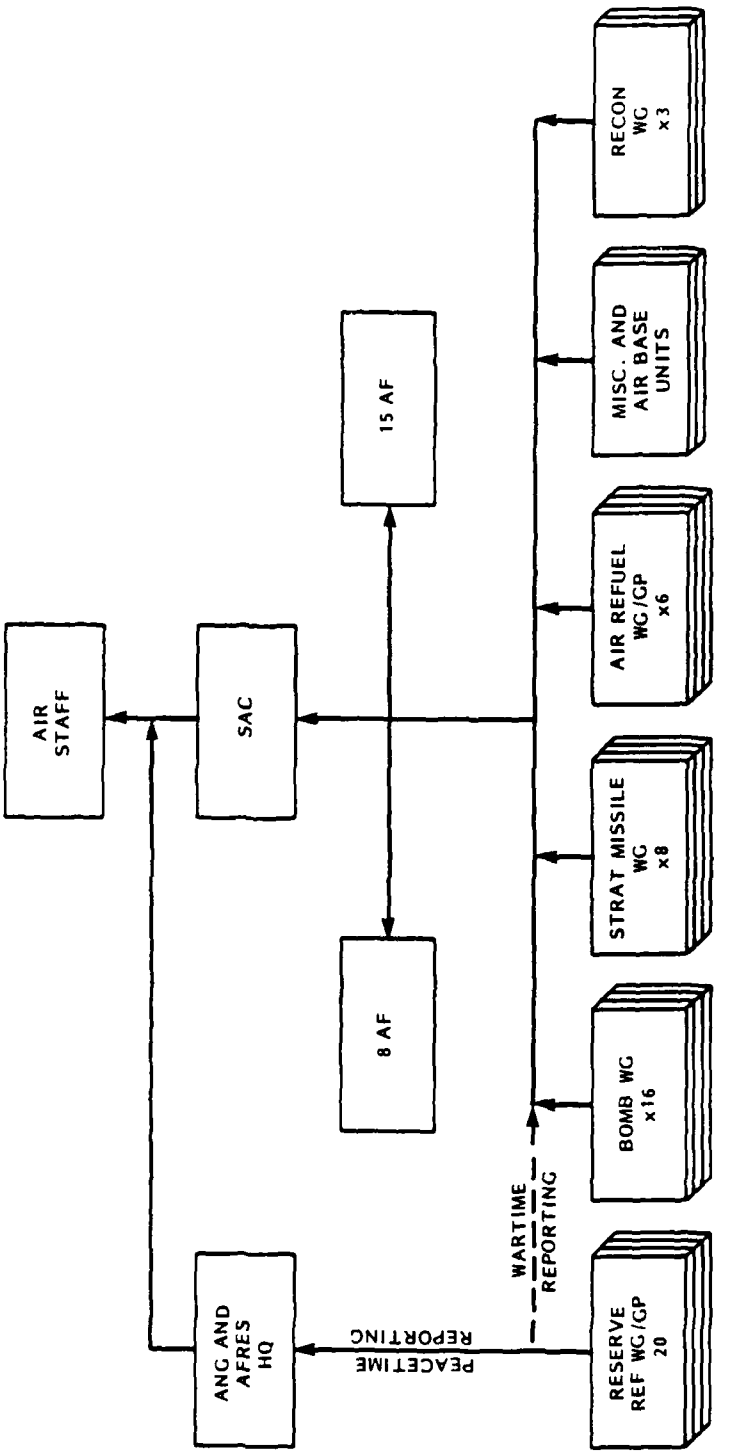

Figure 3-1. AFIRMS Information Flow Diagram - SAC

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3.2.1 HQ SAC Requirements.

1) Translate and review tasking requirements for planning guidance.

2) Determine unit combat capability for peacetime training and resource management, for conduct of exercises, and for crisis/contingency operations.

3) Determine unit and base resource status for exercises and crisis/contingency.

4) Analyze the relationship of Fiscal impacts on readiness for the Planning, Programming and Budgeting process.

3.2.1.1 Planning. In providing planning guidance, personnel at the Air Staff, HQ SAC and the wings require assessment information that provides a picture of both readiness for quick response and for sustainability for SIOP and conventional missions. Both kinds of assessments are needed for operations plans personnel to consider options and to evaluate various scenarios. Logistics personnel require such assessments in order to judge the supportability of the plans under various scenarios.

3.2.1.2 Peacetime Resource Management. The various mission areas each require a slightly different capability assessment focus. An important need of SAC users is an integrated view of readiness and sustainability for ad hoc tasking. Several existing models are used for individual functional areas, but no single system gives a comprehensive picture to prioritize the problem areas or to show the integrated relationships among resources. Bomber assessment for the SIOP must focus on two areas: initial, no-warning generation capability and sustained alert capability. Regeneration, resupply, and theatre support are the focus for conventional war tasking. Tanker requirements for SIOP tasking also must focus on no-warning generation capability and sustained alert capability. Capability assessment for tanker conventional tasking must support many different types of aircraft and missions. Sustainability is the key capability concern for airborne command

and control aircraft. The capability assessment of the aircraft must include all elements of the aircraft: airframe, aircrew, mission equipment, and mission crew. The requirement for strategic reconnaissance is for an integrated assessment of the entire weapons system that includes an assessment of sustainability. The missile requirement is for a better predictor of the reliability of the missiles' systems. Alert sortie sustainability is a concern for supply and maintenance managers. The consumption of resources by missiles on alert should be better defined and displayed at HQ SAC.

3.2.1.3 **Exercise and Crisis Requirements.** HQ SAC requires information during conventional exercises and international crises. Near real-time assessments would be useful to Air Staff, HQ SAC and to a theater Commander's staff during exercises and the execution of crisis tasking to monitor unit and total weapon system combat capability. Also, the theater commander's staff should be able to see the integrated capability of all augmentation and theater assets.

3.2.1.4 **Budgeting and Programming.** A principal requirement for capability assessments at the Air Staff, and by capability planners at HQ SAC, is for programming and budgeting. This function requires assessments to analyze and portray long-term trends in readiness, sustainability, and modernization. A summary approach is required for analyzing the relationship of fiscal changes to readiness. The displays of the metrics and assessments for such comprehensive summaries of SAC readiness and sustainability must be clear and uncomplicated, yet consistent with the detailed assessments required by wing commanders and HQ SAC. Ultimately, the assessment should reflect a capability change whenever there are significantly changed levels of personnel, weapon systems, logistics support and facilities.

3.2.2 AFIRMS Users. The staff agencies idenified below are the probable users of AFIRMS. The list is as complete as this study's time permitted. Additional analysis may identify additional users:

SACOS, NAFOS, INO, DOO, DOR, DO8, DOM DOC, LGL, LGM, LGS, LGW, LGB, LGX, XPP, XPH, XPI, XPQ, XPY, XOS, XOO, XOX, DPX, DPA.

3.2.2.1 Potential AFIRMS Product Screen. The purpose of this notional screen is to display a unit's alert sustainability for aircraft or missiles. In this figure, the unit is SAC and the sorties are strategic bombers. The tasking is a notional mission for the SIOP. The term "integrated" means that the assessment reflects the capability of all resources, and the relationships among resources. The five resources shown represent all important resources relevant to the unit's capability. (Figure 3-2).

3.2.3 Wing Information Requirements. The principal information requirements at Wing level are for short-term planning and resource management. The Wing commander and his staff share the responsibilities referred to above. The wing commander also requires information to assess the results of proposed changes in procedures and schedules. The wing commander's concern is to assess impacts to the wing's capability based upon changes in tasking or resource allocation. The ability to execute the tasked mission is the major unit concern.

3.3 Information Flow Between HQ SAC and HQ USAF. The flow of AFIRMS information between HQ USAF and HQ SAC is a two-way flow. However, with the current "push" architecture of AFIRMS, the flow from HQ USAF is limited to message-type information passed via an electronic mail utility program. On the other hand, the flow from HQ SAC to HQ USAF consists of HQ SAC AFIRMS information pushed up to update the HQ USAF database. In addition, HQ SAC can also send messages via an electronic mail utility program.

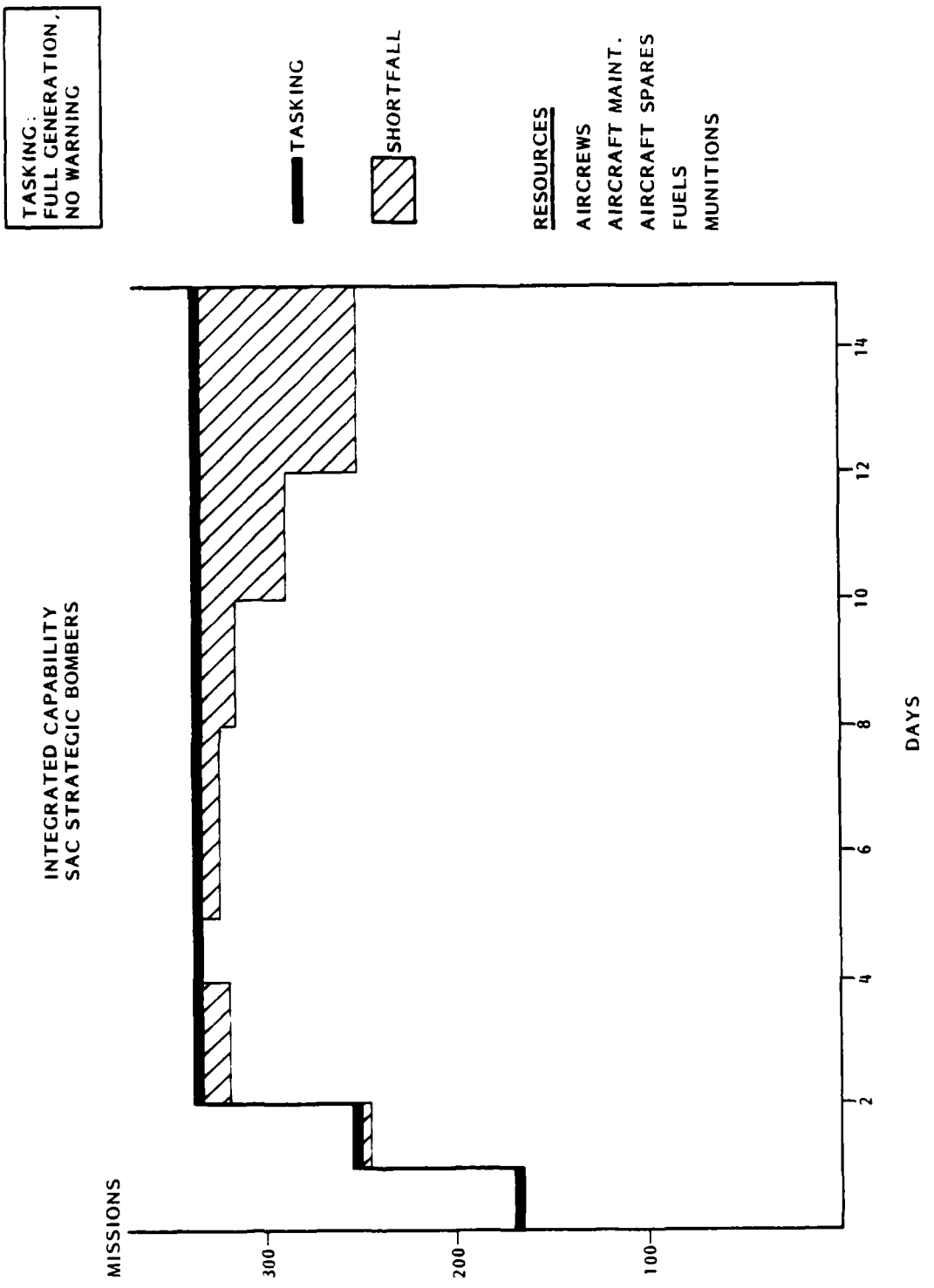

Figure 3-2. Notional Integrated Capability Display

3.4 **New Data Requirements.** Due to the inherent differences between the tactical fighter mission and the strategic bombing mission, there are additional dimensions to AFIRMS data requirements. Some of the data will be input by the user and stored in the AFIRMS database. AFIRMS will compute some of the required data from unit resource data. Appropriate changes to the AFIRMS Data Requirements Document are currently being incorporated. Data requirements changes identified to date are primarily additional legal values for existing AFIRMS data items.

3.5 **AFIRMS Algorithms for SAC.** The addition of the Strategic Air Command to AFIRMS will not require any significant changes in the relationships in the mathematical models, but will require modifications of the variables in those relationships. The modifications are discussed here for each of the five types of aerospace vehicles in SAC - bombers, tankers, reconnaissance aircraft, command and control aircraft, and missiles. Discussion of the five vehicle types is followed by discussion of possible future SAC submodels.

3.5.1 Bombers.

3.5.1.1 Readiness. The basic measure of the readiness of a bomber wing will be the number of alert missions that can be generated within an initial period which might vary in length with the scenario from a few minutes to more than a day.

A bomber will be considered ready for a conventional contingency if it can be made airborne in a mission-capable status within a prescribed initial period. In addition to assessing the basic mission capability, AFIRMS could (given appropriate adjustment factors) compute a mission count adjusted for generation time and system readiness. For example, the readiness of a bomber for a conventional contingency could be factored for the number of hours before the bomber can be made airborne and for any inoperative equipment that makes the bomber only partially mission capable under the applicable Operations Plan. The generation time degradation factor might be linear, such as three or four percent for each hour of delay, or it might be nonlinear. Selection of the degradation factor would depend upon the tasking and would be made a user variable parameter.

A bomber will be considered ready for SIOP launch if it can be made alert ready in at least an Emergency War Order "go" status within the prescribed initial period. In addition to assessing alert generation, readiness could be factored as it is for a conventional contingency for any inoperative equipment or components.

The wing readiness data sent to MAJCOM and HQ USAF could include a data readiness index as a convenient summary of the detailed alert and repair status data. A suitable single-number index might be the sum of the degraded ready aircraft numbers. A report on generation of a full alert will include estimated recall delays for airborne aircraft and estimated repair delays for aircraft off flight status.

3.5.1.2 **Sustainability.** Sustainability for a conventional contingency will be measured in the same manner as it is for USAFE with the estimated sortie generation capability for each day. Factoring, however, might be a desirable additional feature. The estimated sortie generation capability for each day of a period of up to 60 days could be multiplied by the factor applicable for that days to yield a factored total for the period. Sustainability for SIOP will be the unfactored sum of the readiness ratings for each day of the period. These assessments will require estimation of equipment failure rates for aircraft on ground alert, prediction of failure rates for airborne alerts, and prediction of repair times for equipment failing on alert. Predictions will be based on historical or representative failure rates.

A final step in the wing sustainability assessment could be the summarization of the assessment into one or two simple indexes for the convenience of some users at HQ SAC and HQ USAF. The summarization would not have to be hour-by-hour or day-by-day aircraft status predictions. These predictions could be condensed into a set of parameters.

3.5.2 **Tankers.** Tankers are not expected to require any changes in the readiness or sustainability algorithms in AFIRMS. In the event any changes are required, they probably will not occur during the initial phases of the incorporation of AFIRMS into SAC because these phases will have the same measure for tankers and bombers. Readiness will be measured by sortie generation capability, and sustainability will be measured by the sum of the factored sortie generation capabilities for all the days of the sustainability period.

3.5.3 **Reconnaissance Aircraft.** The incorporation of strategic reconnaissance aircraft into AFIRMS, like the incorporation of the tankers, will require no changes in the readiness model for sorties without refueling. If refueling is desired, the refueling submodel will have to be added to AFIRMS. In addition, each potential refueled sortie will be multiplied by its expected relative duration in the measurement of readiness. This may require a larger aircrew and most certainly will reduce the potential number of sorties per week. Sustainability, whether with standard sorties alone or a combination of standard and extended sorties, will be measured as it is now.

3.5.4 **Command and Control Aircraft.** The bomber readiness model is expected to be applicable also to the command and control aircraft. The sustainability model also will be the same as the bomber sustainability model except that the C^2 aircraft will generally be required to maintain an airborne alert status. If the War Plan and Operations Plan included refueling, the tanker sustainability model would have to be run prior to the run of the C^2 sustainability model in order to determine the refueling capacity inputs.

3.5.5 **Missiles.** The missile readiness and sustainability models will be similar to the bomber SIOP models except that there will be little generation to an alert status because missiles normally remain on alert most of the time. Sustainability will be the number of days in the period of interest during which the missile remains in a continuous alert status. As with the bombers, the sustainability model for missiles will require data bases on alert status failure rates and repair times, and daily availability status reports on crews, equipment, and facilities.

3.5.6 Possible Future SAC Submodels.

This area needs additional analysis, however preliminary indications of what might be needed are listed below.

3.5.6.1 Dollars-To-Readiness. A SAC fiscal impact on readiness submodel would be developed after the readiness and sustainability models are in existence. A SAC cost data base will have to be compiled for use by AFIRMS. This area needs considerable additional analysis.

3.5.6.2 Failure Rate and Repair Time Submodels. Failure rate and repair time submodels will have to be developed for SAC. Repair times for peacetime equipment failures could be compiled very easily from the Maintenance Data Collection system, D056. At present there is no comparable data base for combat damage repair times that would be valid for future conflicts.

3.5.6.3 Line Replaceable Unit Submodels. The first phase of the development of the SAC model will have only parametric submodeling of equipment failures and repairs. The final model should have more complete submodeling of failures and repairs for the entire aircraft. Consideration should also be given to an intermediate phase during which detailed failure and repair submodeling is developed for the most essential line replaceable units (LRU) in one or more classes of aircraft.

The parametric submodels could be ready before the detailed models of the complete aircraft, and could, therefore, serve as tests of procedures and equipment before the complete models are developed. A set of 10-20 critical LRUs for each class of aircraft would be more practical for model development purposes than a complete set that might be some one hundred times as large, particularly if the test set consisted of LRUs for which there is a substantial data base.

SECTION 4. SAC AFIRMS ADP REQUIREMENTS

4.1 Need For Integration of Systems. An important charter of AFIRMS is to integrate whenever possible with existing automated data systems. The need for this requirement is most visible within SAC because of the high degree of automation already present. However, extensive analysis must be performed to identify the best sources and interfaces for the data necessary to AFIRMS assessments. Accordingly, the higher the degree of data automation already present, the greater the amount of information that needs to be gathered concerning existing ADP systems and possible interfaces to them.

Data gathering that supports an effective data system integration for AFIRMS within SAC is two-fold: locate data to be used as input to AFIRMS, and locate systems that would like to make use of AFIRMS outputs. The accomplishment of these goals should be attempted with little or no increase in hardware requirements. AFIRMS should cooperate in the use and standardization of such technologies as communication protocols, interprocessor graphics display, higher-order, machine-independent languages, and Data Base Management Systems (DBMSs). Configuration management techniques and system interface security technologies that are DoD-common should also be utilized. AFIRMS should not be instrumental in implementing or re-inventing these technologies but should be aware of and cooperate in any planned or current system implementation utilizing them within SAC. With the planned modernization of the World Wide Military Command and Control System (WWMCCS) these issues are amplified because of the greater need for standardization and elimination of "stovepipe" information systems redundancies.

4.2 AFIRMS Interfaces with Information Systems in SAC. There is concern within HQ SAC about the proliferation of "stovepipe" information systems. HQ SAC has expressed the desire for information systems support at the unit level. AFIRMS interface to the host system in SAC should minimize labor-intense, error prone human interfaces. AFIRMS must complement and augment existing and planned SAC automated information systems.

AFIRMS should have the capability to operate autonomously at the unit level for short periods of communications outages or disruptions. Automation at unit level also helps to minimize the heavy demands for long-line communications during high stress periods.

4.2.1 USAF Standard Information Systems. Short summary descriptions of various standard Air Force systems that possess or utilize data of interest to AFIRMS are given in the following sections. The discussion is not intended to be all-inclusive but is intended to describe the types of functional data with which AFIRMS could interface in the SAC environment and some of the problems associated with interfacing to these different systems.

4.2.1.1 Air Force Operations Resource Management System (AFORMS). AFORMS contains information regarding the training status of aircrew. More specifically, the system contains aircrew skill levels and events completed versus training events required. AFIRMS needs this information to assess aircrew capability and sustainability and to predict readiness of aircrew members against different tasking scenarios. A totally automated interface between AFIRMS and AFORMS may be most desirable but not so practical as an air-gap interface, for the initial implementation. This might include a tape containing an aggregate number of mission-ready aircrew by position and skill level delivered to and loaded into the AFIRMS database on a daily or more frequent basis. However, some of the same aircrew data is available in the FMIS data system which is also currently operational at HQ SAC. The technology to interface the base-level unclassified AFORMS with a classified environment has yet to be perfected. The timeliness and quality of information within AFORMS regarding deployed units also needs to be addressed.

4.2.1.2 **Weapons Systems Management Information System (WSMIS).** WSMIS is intended to provide a logistics measure of readiness and sustainability for weapons systems and key resource groups throughout the Air Force. WSMIS consists of three separate modules:

1) Readiness Assessment Module (RAM) - measures wartime readiness of weapons systems and resources required to launch.

2) Sustainability Assessment Module (SAM) - calculates individual and integrated capability of weapons systems and key resources based on WMP-5 or user-entered scenario.

3) Get-Well Assessment Module (GWAM) - identifies critical limited factors as collected by RAM and SAM, isolates causes, evaluates near term and long term get-well plans, and monitors progress of get-well solutions.

Currently, only SAM has been implemented for SAC for B-52G and B-52H bombers, and KC-135 tankers against WMP-5 tasking. Data from the Combat Supplies Management System (CSMS) is passed up daily from the units to HQ AFLC via AUTODIN. The SAM is executed at HQ AFLC on a weekly basis using the CSMS data as input and the results are made available to HQ SAC within 3 days. The results that are of interest to AFIRMS include sortie capability for spares and WMP-5 sorties demanded by day by MDS. There are only nine different days of the thirty-day WMP-5 scenario available per SAM run for each MAJCOM due to hardware constraints at HQ AFLC. Planned upcoming improvements include an integration of engines into the capability assessments by November 1985 and munitions and consumables by February 1986. Aircrews are not planned to be integrated into WSMIS. The number of days output is also planned to be increased to 15 days. Ad-hoc tasking can currently be input for SAC at HQ AFLC, but on a limited basis. The procedure to input this tasking is somewhat inconvenient, but is due to be improved.

Eventually, AFIRMS may use as input all available sortie capability assessments for the major resource areas generated by WSMIS, if those assessments become certified. Of course, aircrew capability would have to be obtained elsewhere and utilized in order to obtain a truly integrated sortie

capability outlook. In the interim, spares capability output from WSMIS could be utilized by AFIRMS at least for assessment of individual resource capabilities for aircraft. As the other resource areas come on-line they will be integrated into AFIRMS combat capability assessments.

4.2.1.3 **WWMCCS and SAC WIS.** The WWMCCS Information System (WIS) encompasses the information collection, processing, and display system that currently includes WWMCCS ADP and related software systems, procedures, and telecommunications. The WIS is the modernization of WWMCCS and focuses on the backbone of the standard WWMCCS ADP system which supports command and control functions on the Honeywell H6000-based systems. AFWIS is the Air Force modernization of WWMCCS, and SAC WIS is the specific upgrade within SAC.

Due to the impending upgrade to WIS at SAC in 1989, it is impractical to implement and interface between AFIRMS and the existing WWMCCS at SAC. However, AFIRMS functional requirements should be incorporated into the design of SAC WIS to minimize the amount of hardware, software, and data redundancy at both wing and headquarters level.

4.2.1.4 **Core Automated Maintenance System (CAMS).** CAMS is a top-down directed system that is designed to improve the readiness of the USAF by enhancing the flow and availability of logistics information to maximize the utilization of resources. An accurate flow of maintenance data from the flightline through the system is due to occur in the most expeditious manner that available technology will support. A major objective of CAMS is to eventually designate it as the sole standard base-level system for collecting and processing maintenance information. In later phases, CAMS is also planned to be deployable.

The availability of timely and accurate base-level aircraft maintenance data is vital for AFIRMS to make capability assessments that are useful to wing commanders. In turn, the accuracy of the information that is passed

upward to HQ SAC is also enhanced. The concept of AFIRMS interfacing with CAMS directly, or indirectly through a SAC WIS architecture, warrants further study. This is due primarily to the proposed accuracy of information within CAMS but also to minimize the amount of unnecessary data redundancy within SAC. AFIRMS may be instrumental in providing an integration mechanism to minimize this redundancy between any current and future base-level ADP systems in SAC.

4.2.2 SAC-Unique Information Systems.

4.2.2.1 Force Management Information System (FMIS). FMIS is a SAC-unique information system currently used to support much of the command and control decision-making within SAC. Available within its database is status information regarding many of the major resource areas needed by AFIRMS. FMIS is due to be upgraded into FMIS II under the SAC WIS implementation. Current plans are to migrate the current FMIS database to a commercial off-the-shelf (COTS) type of DBMS under SAC WIS. It is anticipated that the AFIRMS database will also be controlled by the same DBMS. Logically, however, AFIRMS output data will remain separate from the FMIS II output data even though the input data may be shared by the two systems.

Since FMIS is due to be upgraded under SAC WIS, it may not be feasible to attempt to build an interface between the current version and AFIRMS. It may be more effective to design an interface between the two and implement it as a part of SAC WIS.

4.3 *Information System Changes to Accommodate AFIRMS.* A number of implementation options exist for AFIRMS within SAC. Regardless of the implementation alternative that is selected, some SAC-unique and Air Force standard systems will probably have evolved through the normal growth/upgrade process in order to provide data to AFIRMS or to use the results of AFIRMS assessments. Of the alternatives that were considered, only three were

considered viable. Those alternative implementations include a dedicated approach, an approach in which AFIRMS is a software application under FMIS, and an alternative that equates AFIRMS to a logical subsytem of SAC WIS.

4.3.1 **Dedicated Approach.** This alternative requires the least accommodation by other systems and is very similar to the AFIRMS LPP approach in that there is a dedicated processor, or cluster of processors, resident at each Air Force command level where AFIRMS executes. The cluster has a centralized database with microcomputers, terminals, and printers located at each functional area. The system will operate at the top secret level and will have a one-way air-gap interface from the FMIS database to AFIRMS. The interface would occur on a specified time period (weekly, daily, etc.) and would be programmed in the language (currently Jovial) in which the majority of the controlling software of the FMIS is written.

4.3.2 **Software Application Approach.** This alternative embeds AFIRMS as a software application resident on the Honeywell H6000 at HQ SAC. At each participating functional area is a color graphics-capable microcomputer or CRT capable of displaying AFIRMS products in both graphic and tabular format. All application software is written in a high-level portable language, e.g., Ada*, in anticipation of upgrading to SAC WIS. A one-way interface exists between AFIRMS and the existing FMIS database, where necessary AFIRMS input data resides.

The interface must occur through the FMIS database management system, which is written in JOVIAL and Honeywell assembler. Any communications requirement of AFIRMS from HQ SAC to the wing level would utilize existing communications. The application would run at the top secret classification mode on existing hardware because it would be located on the same machine

*Ada is a registered trademark of the U.S. Government (Ada Joint Program Office).

as FMIS. The AFIRMS computer programs may require less than ten megabytes of runtime memory to execute.

4.3.3 SAC WIS Integration. This alternative fully integrates AFIRMS' functional requirements into the WMCCS Information System development within SAC, referred to as SAC WIS. Figure 4-1 illustrates a very simplistic view of a logical architecture for this integration. The physical integration of processing power and data storage has yet to be determined. AFIRMS would be available on the top secret local area network (LAN) currently proposed in the SAC WIS architecture. Existing command and control information available on the Force Status System database would be used as inputs. This system is also proposed to be available on the TS LAN in SAC WIS. AFIRMS would reside on SAC WIS-compatible equipment and be written in a high-level portable host language available on that hardware, e.g., Ada.

The COTS DBMS utilized by FMIS II should also be utilized by AFIRMS, although it is undecided whether the data output from either system should physically reside together. Preliminary analysis suggests that AFIRMS will have read-only privileges for data that is generated and maintained by FMIS II. This implementation alternative is thought to have the least impact on the parallel development of other information systems within SACWIS. In this alternative, it is assumed that AFIRMS output data, specifically capability assessments and budget capability projections, are of minimal use to FMIS II. Data can be transmitted to other command levels via AUTODIN, or the WIN Gateway using DDN. AUTODIN may also be used to receive spares and other resource capability assessment data from WSMIS at HQ AFLC, if necessary.

It is important to note that AFIRMS integration with SAC WIS may also introduce certain unique graphics requirements for SAC WIS. These requirements are necessary in order to satisfy AFIRMS' need for graphics display capability at functional user areas for both the wing and HQ SAC levels. The illustration assumes that the functional area workstations

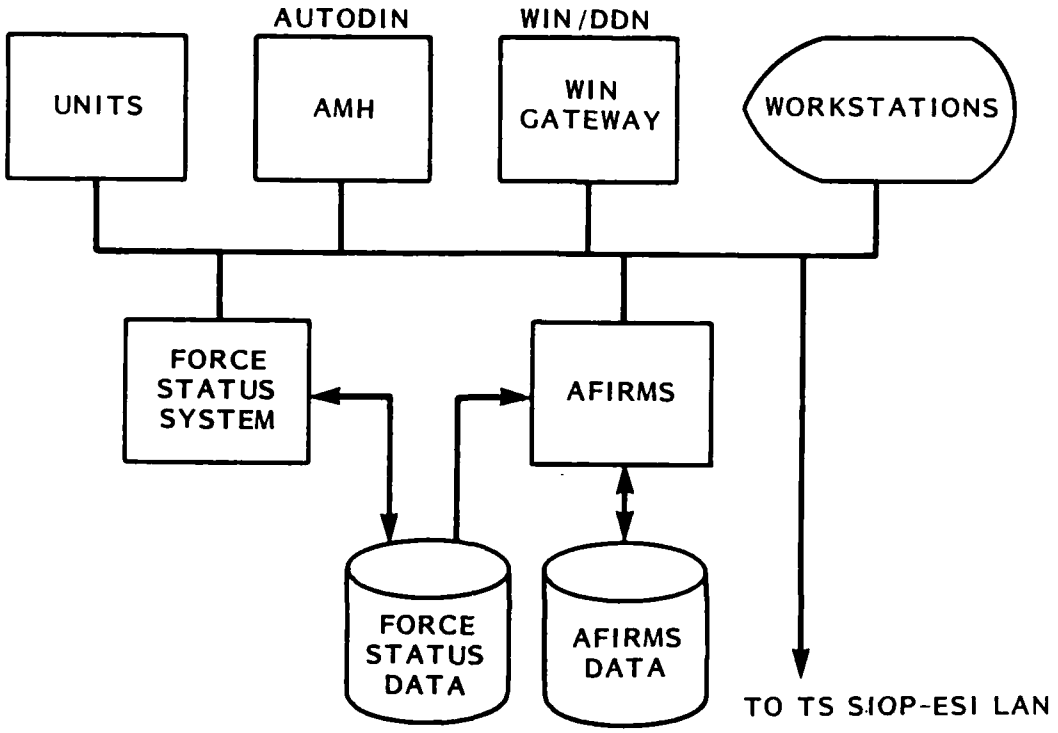

Figure 4-1. AFIRMS/SAC WIS Logical Architecture

possess this capability. These workstations are also anticipated to have a limited data storage capability enabling a decentralization of both processing and data requirements from the SAC WIS mainframe(s). Many of the same functional requirements of HQ SAC would apply to the wing. Therefore, unit-level computers for AFIRMS would be needed to bring units on-line under SAC WIS. There is also the need for autonomous operation of AFIRMS at the wing level. It is not necessary for AFIRMS to operate on a LAN at wing-level during IOC SAC WIS. However, since SAC plans to implement LANs in the wings, AFIRMS should be designed to ensure that a smooth transition occurs when Wing LANs are installed.

SECTION 5. RECOMMENDATIONS

SAC has sophisticated ADP systems in operation, or programmed, to satisfy most of their readiness and sustainability assessment requirements. However, many of these systems are SAC-unique. None of the systems adequately describe integrated SAC readiness or sustainability, nor the fiscal quantification to readiness.

AFIRMS should be implemented in SAC for two important reasons: 1) AFIRMS provides a uniform framework for force programming by HQ USAF and the Congress, and 2) AFIRMS will integrate and improve disparate stovepipe systems.

As indicated throughout this document, additional analysis is required before an implementation alternative is selected for SAC. This initial analysis highlights some of the potential areas, such as integration with other systems, display requirements, and hardware/software options that must be considered in the analysis. The AFIRMS Management Plan and Implementation Plan concepts allow for this analysis as part of the implementation process.

APPENDIX A. SUMMARY OF AFIRMS DOCUMENT CHANGES FOR SAC

SAC research and analysis efforts have identified SAC-specific requirements which must be considered in implementing AFIRMS worldwide. These newly identified SAC requirements have been incorporated as Change 1 into AFIRMS documentation, and are in four general categories:

a. Metric. As a result of the SAC (and concurrent MAC) metric analysis efforts, a candidate universal AFIRMS capability assessment metric has been identified. This metric is "mission." Changes to the Functional Description, System and Subsystem Specifications have been made to identify this AFIRMS universal metric as well as the alternative perspectives, i.e., sorties and flying hours.

b. ADP System Interface Candidates. Numerous ADP systems were identified as containing data required by AFIRMS algorithms. These systems have been included in he Functional Description, System and Subsystem Specifications.

c. Command Structure. The role of the NAF in the AFIRMS reporting structure will be clarified in the Functional Description, System and Subsystem Specifications.

d. Data Requirements. In-depth analysis is needed to identify in detail the additional data elements required for SAC AFIRMS algorithms. However, the results of this preliminary SAC analysis will be added to the AFIRMS Data Requirements Document. As an example, the new universal metric and alternate perspectives will need new data elements. These will cascade into changes for each instance where the task or capability was expressed as sorties.

END

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